the wheel must be fitted with a suitable tire of proper fit with a speed rating approved by the Administrator that is not exceeded under critical conditions and with a load rating approved by the Administrator that is not exceeded under—

(1) The loads on the main wheel tire, corresponding to the most critical combination of airplane weight (up to maximum weight) and center of gravity position, and

(2) The loads corresponding to the ground reactions in paragraph (b) of this section, on the nose wheel tire, except as provided in paragraphs (b)(2) and (b)(3) of this section.

(b) The applicable ground reactions for nose wheel tires are as follows:

(1) The static ground reaction for the tire corresponding to the most critical combination of airplane weight (up to maximum ramp weight) and center of gravity position with a force of 1.0g acting downward at the center of gravity. This load may not exceed the load rating of the tire.

(2) The ground reaction of the tire corresponding to the most critical combination of airplane weight (up to maximum landing weight) and center of gravity position combined with forces of 1.0g downward and 0.31g forward acting at the center of gravity. The reactions in this case must be distributed to the nose and main wheels by the principles of statics with a drag reaction equal to 0.31 times the vertical load at each wheel with brakes capable of producing this ground reaction. This nose tire load may not exceed 1.5 times the load rating of the tire.

(3) The ground reaction of the tire corresponding to the most critical combination of airplane weight (up to maximum ramp weight) and center of gravity position combined with forces of 1.0g downward and 0.20g forward acting at the center of gravity. The reactions in this case must be distributed to the nose and main wheels by the principles of statics with a drag reaction equal to 0.20 times the vertical load at each wheel with brakes capable of producing this ground reaction. This nose tire load may not exceed 1.5 times the load rating of the tire.

(c) When a landing gear axle is fitted with more than one wheel and tire assembly, such as dual or dual-tandem, each wheel must be fitted with a suitable tire of proper fit with a speed rating approved by the Administrator that is not exceeded under critical conditions, and with a load rating approved by the Administrator that is not exceeded by—

(1) The loads on each main wheel tire, corresponding to the most critical combination of airplane weight (up to maximum weight) and center of gravity position, when multiplied by a factor of 1.07; and

(2) Loads specified in paragraphs (a)(2), (b)(1), (b)(2), and (b)(3) of this section on each nose wheel tire.

(d) Each tire installed on a retractable landing gear system must, at the maximum size of the tire type expected in service, have a clearance to surrounding structure and systems that is adequate to prevent unintended contact between the tire and any part of the structure or systems.

(e) For an airplane with a maximum certificated takeoff weight of more than 75,000 pounds, tires mounted on braked wheels must be inflated with dry nitrogen or other gases shown to be inert so that the gas mixture in the tire does not contain oxygen in excess of 5 percent by volume, unless it can be shown that the tire liner material will not produce a volatile gas when heated or that means are provided to prevent tire temperatures from reaching unsafe levels.

[Amdt. 25–48, 44 FR 68752, Nov. 29, 1979; Amdt. 25–72, 55 FR 29777, July 20, 1990, as amended by Amdt. 25–78, 58 FR 11781, Feb. 26, 1993]

§ 25.735 Brakes.

(a) Each brake must be approved.

(b) The brake system and associated systems must be designed and constructed so that if any electrical, pneumatic, hydraulic, or mechanical connecting or transmitting element (excluding the operating pedal or handle) fails, or if any single source of hydraulic or other brake operating energy supply is lost, it is possible to bring the airplane to rest under conditions specified in § 25.125, with a mean deceleration during the landing roll of at least

50 percent of that obtained in determining the landing distance as prescribed in that section. Subcomponents within the brake assembly, such as brake drum, shoes, and actuators (or their equivalents), shall be considered as connecting or transmitting elements, unless it is shown that leakage of hydraulic fluid resulting from failure of the sealing elements in these subcomponents within the brake assembly would not reduce the braking effectiveness below that specified in this paragraph.

(c) Brake controls may not require excessive control force in their operation.

(d) The airplane must have a parking control that, when set by the pilot, will without further attention, prevent the airplane from rolling on a paved, level runway with takeoff power on the critical engine.

(e) If antiskid devices are installed, the devices and associated systems must be designed so that no single probable malfunction will result in a hazardous loss of braking ability or directional control of the airplane.

(f) The design landing brake kinetic energy capacity rating of each main wheel-brake assembly shall be used during qualification testing of the brake to the applicable Technical Standard Order (TSO) or an acceptable equivalent. This kinetic energy rating may not be less than the kinetic energy absorption requirements determined under either of the following methods:

(1) The brake kinetic energy absorption requirements must be based on a rational analysis of the sequence of events expected during operational landings at maximum landing weight. This analysis must include conservative values of airplane speed at which the brakes are applied, braking coefficient of friction between tires and runway, aerodynamic drag, propeller drag or power-plant forward thrust, and (if more critical) the most adverse single engine or propeller malfunction.

(2) Instead of a rational analysis, the kinetic energy absorption requirements for each main wheel-brake assembly may be derived from the following formula, which must be modified in cases of designed unequal braking distributions.

$$KE = \frac{0.0443WV^2}{N}$$

Where—

KE=Kinetic energy per wheel (ft.-lb.);

W=Design landing weight (lb.);

V=Airplane speed in knots. V must not be less than $V_{S0,}$ the power off stalling speed of the airplane at sea level, at the design landing weight, and in the landing configuration; and

N=Number of main wheels with brakes.

(g) The minimum stalling speed rating of each main wheel-brake assembly (that is, the initial speed used in the dynamometer tests) may not be more than the *V* used in the determination of kinetic energy in accordance with paragraph (f) of this section, assuming that the test procedures for wheel-brake assemblies involve a specified rate of deceleration, and, therefore, for the same amount of kinetic energy, the rate of energy absorption (the power absorbing ability of the brake) varies inversely with the initial speed.

(h) The rejected takeoff brake kinetic energy capacity rating of each main wheel-brake assembly that is at the fully worn limit of its allowable wear range shall be used during qualification testing of the brake to the applicable Technical Standard Order (TSO) or an acceptable equivalent. This kinetic energy rating may not be less than the kinetic energy absorption requirements determined under either of the following methods:

(1) The brake kinetic energy absorption requirements must be based on a rational analysis of the sequence of events expected during an accelerate-stop maneuver. This analysis must include conservative values of airplane speed at which the brakes are applied, braking coefficient of friction between tires and runway, aerodynamic drag, propeller drag or powerplant forward thrust, and (if more critical) the most adverse single engine or propeller malfunction.

(2) Instead of a rational analysis, the kinetic energy absorption requirements for each main wheel brake assembly may be derived from the following formula, which must be modified in cases of designed unequal braking distributions:

$$KE = \frac{0.0443WV^2}{N}$$

Where—

KE=Kinetic energy per wheel (ft.-lb.);
W=Airplane weight (lb.);
V=Airplane speed (knots);
N=Number of main wheels with brakes; and
W and V are the most critical combination of takeoff weight and ground speed obtained in a rejected takeoff.

[Doc. No. 5066, 29 FR 18291, Dec. 24, 1964, as amended by Amdt. 25–23, 35 FR 5676, Apr. 8, 1970; Amdt. 25–48, 44 FR 68742, Nov. 29, 1979; Amdt. 25–72, 55 FR 29777, July 20, 1990; Amdt. 25–92, 63 FR 8320, Feb. 18, 1998]

§ 25.737 Skis.

Each ski must be approved. The maximum limit load rating of each ski must equal or exceed the maximum limit load determined under the applicable ground load requirements of this part.

FLOATS AND HULLS

§ 25.751 Main float buoyancy.

Each main float must have—

(a) A buoyancy of 80 percent in excess of that required to support the maximum weight of the seaplane or amphibian in fresh water; and

(b) Not less than five watertight compartments approximately equal in volume.

§ 25.753 Main float design.

Each main float must be approved and must meet the requirements of § 25.521.

§ 25.755 Hulls.

(a) Each hull must have enough watertight compartments so that, with any two adjacent compartments flooded, the buoyancy of the hull and auxiliary floats (and wheel tires, if used) provides a margin of positive stability great enough to minimize the probability of capsizing in rough, fresh water.

(b) Bulkheads with watertight doors may be used for communication between compartments.

PERSONNEL AND CARGO ACCOMMODATIONS

§ 25.771 Pilot compartment.

(a) Each pilot compartment and its equipment must allow the minimum flight crew (established under § 25.1523) to perform their duties without unreasonable concentration or fatigue.

(b) The primary controls listed in § 25.779(a), excluding cables and control rods, must be located with respect to the propellers so that no member of the minimum flight crew (established under § 25.1523), or part of the controls, lies in the region between the plane of rotation of any inboard propeller and the surface generated by a line passing through the center of the propeller hub making an angle of five degrees forward or aft of the plane of rotation of the propeller.

(c) If provision is made for a second pilot, the airplane must be controllable with equal safety from either pilot seat.

(d) The pilot compartment must be constructed so that, when flying in rain or snow, it will not leak in a manner that will distract the crew or harm the structure.

(e) Vibration and noise characteristics of cockpit equipment may not interfere with safe operation of the airplane.

[Doc. No. 5066, 29 FR 18291, Dec. 24, 1964, as amended by Amdt. 25–4, 30 FR 6113, Apr. 30, 1965]

§ 25.772 Pilot compartment doors.

For an airplane that has a maximum passenger seating configuration of more than 20 seats and that has a lockable door installed between the pilot compartment and the passenger compartment:

(a) The emergency exit configuration must be designed so that neither crewmembers nor passengers need use that door in order to reach the emergency exits provided for them; and